

ENERGY PRODUCTION AND MANAGEMENT

The total area of solar panel is 11240 m². Given current capture rates of comparable technology and the weather data provided, our team has estimated that solar panels can harness approximately 80% of the potential energy. The area and rated output of solar panels we assumed are 2 m²/panel and 300 W/panel, respectively. About 1.7 MW solar panels can be installed in the design area. Annual power generation was estimated on the basis of annual global solar exposure (MWh/year/m²) and the efficiency.

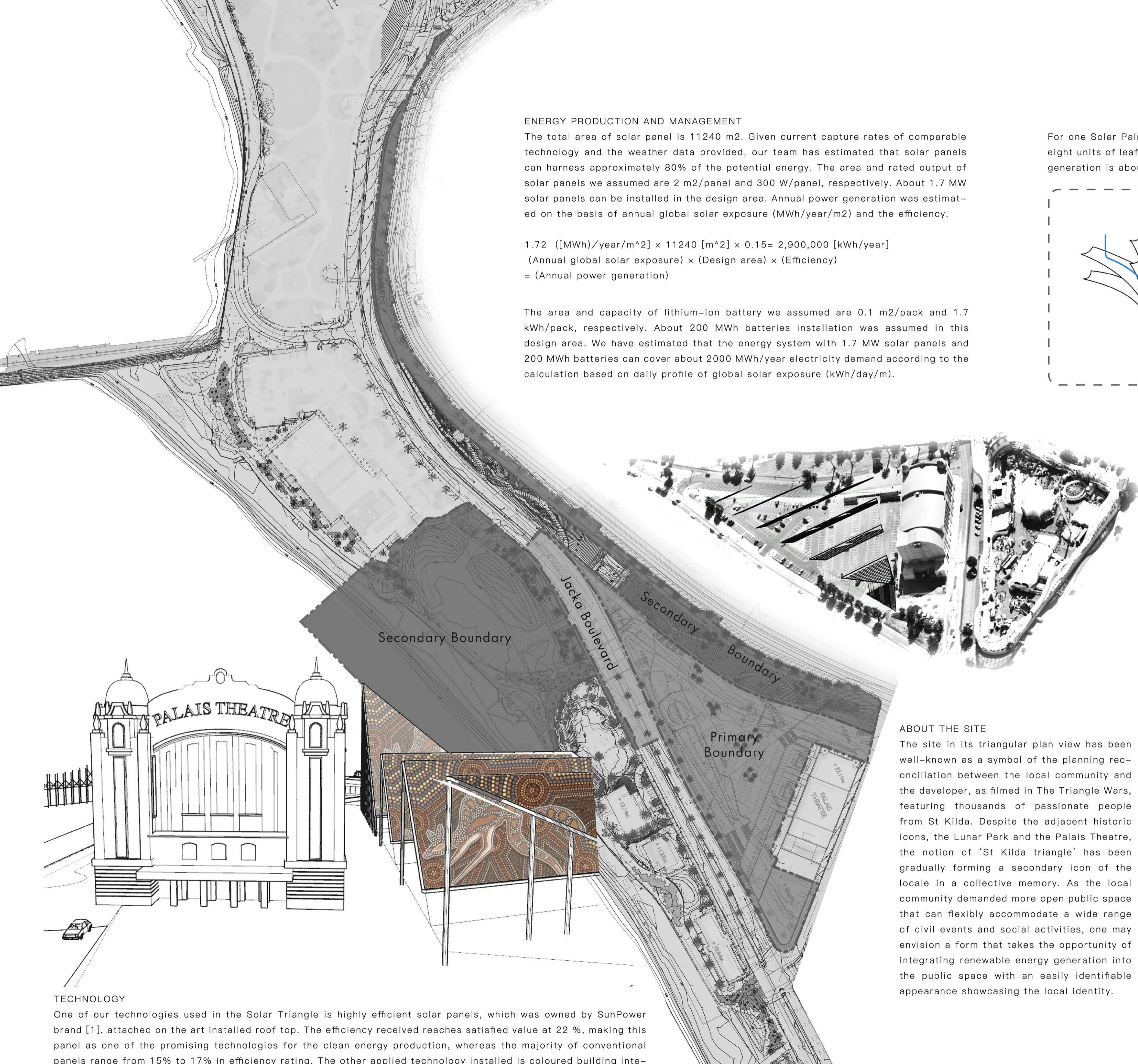
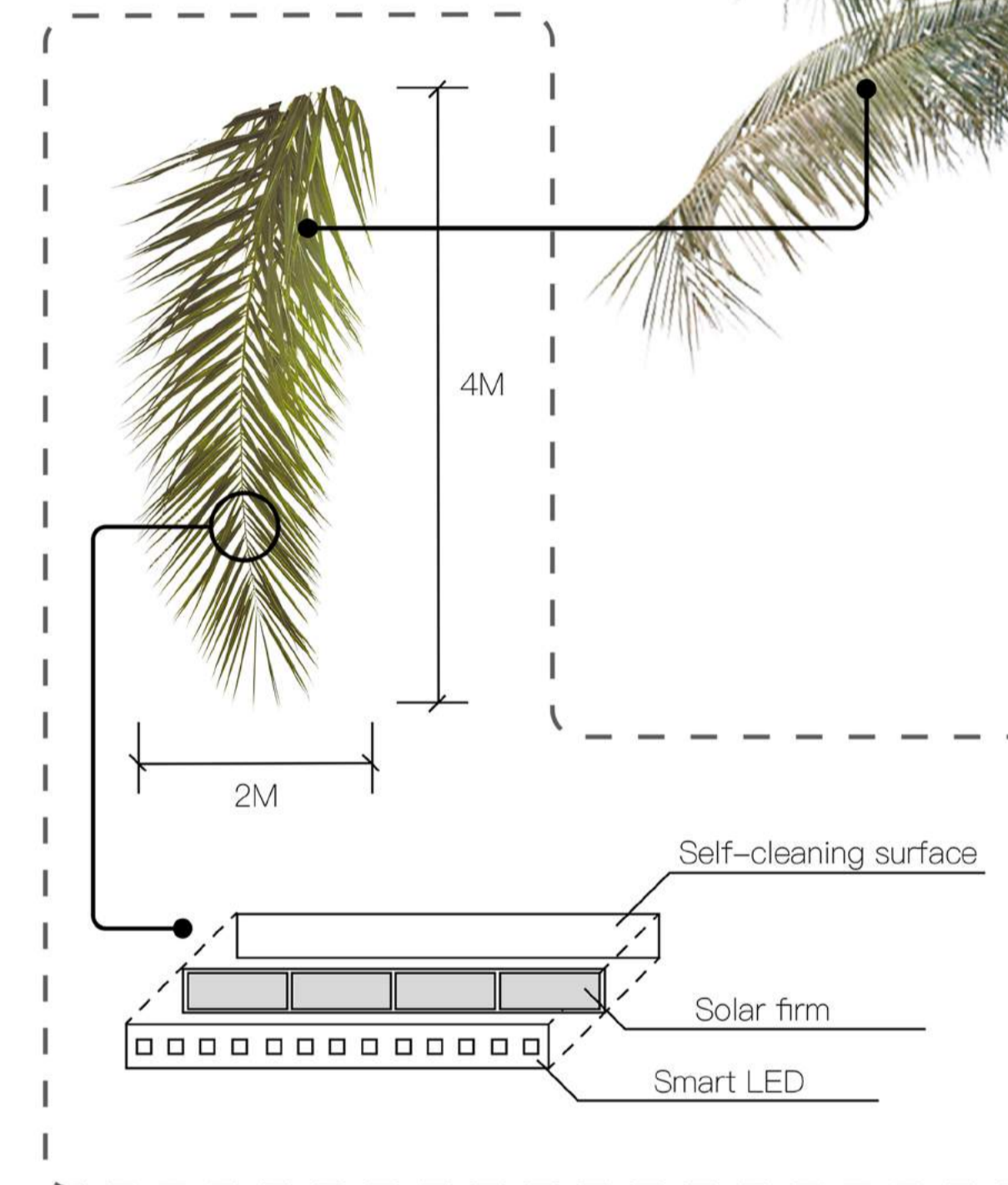
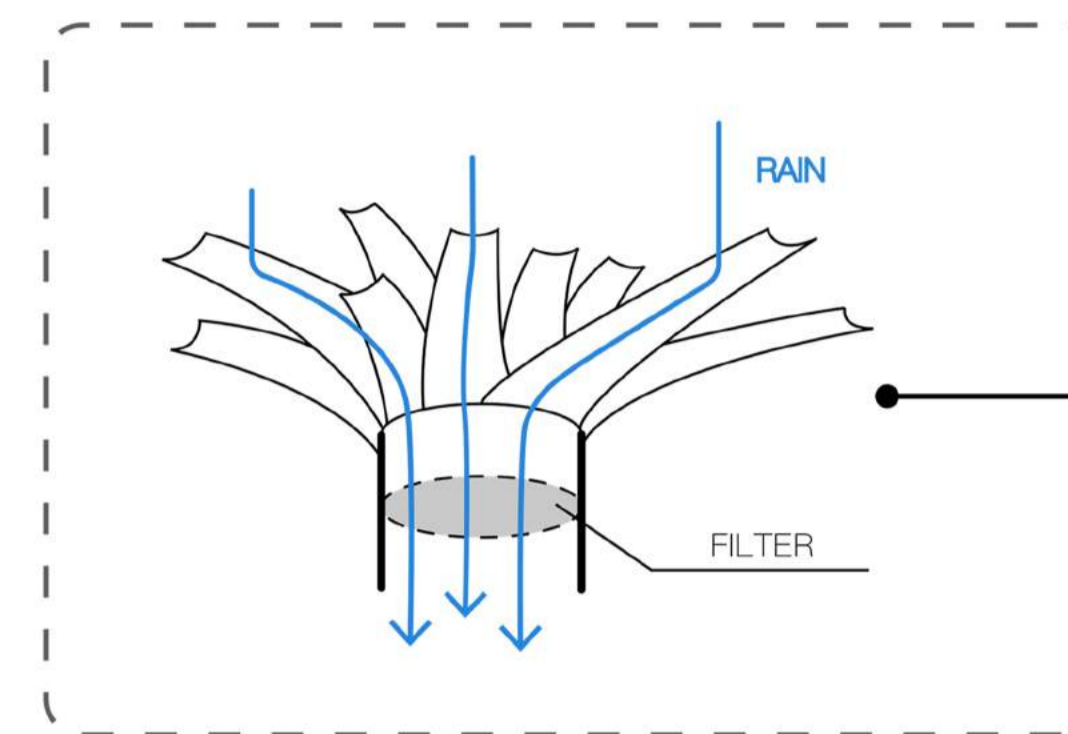
$$1.72 \text{ [(MWh)/year/m}^2] \times 11240 \text{ [m}^2] \times 0.15 = 2,900,000 \text{ [kWh/year]}$$

$$= (\text{Annual global solar exposure}) \times (\text{Design area}) \times (\text{Efficiency})$$

$$= (\text{Annual power generation})$$

The area and capacity of lithium-ion battery we assumed are 0.1 m²/pack and 1.7 kWh/pack, respectively. About 200 MWh batteries installation was assumed in this design area. We have estimated that the energy system with 1.7 MW solar panels and 200 MWh batteries can cover about 2000 MWh/year electricity demand according to the calculation based on daily profile of global solar exposure (kWh/day/m).

For one Solar Palm Tree, taken the average efficiency of 22.5%, for eight units of leaf with leaf's dimension of 4m*2m, the annual power generation is about 19,000kWh/tree.



ABOUT THE SITE

The site in its triangular plan view has been well-known as a symbol of the planning reconciliation between the local community and the developer, as filmed in *The Triangle Wars*, featuring thousands of passionate people from St Kilda. Despite the adjacent historic icons, the Lunar Park and the Palais Theatre, the notion of 'St Kilda triangle' has been gradually forming a secondary icon of the locale in a collective memory. As the local community demanded more open public space that can flexibly accommodate a wide range of civil events and social activities, one may envision a form that takes the opportunity of integrating renewable energy generation into the public space with an easily identifiable appearance showcasing the local identity.

TECHNOLOGY

One of our technologies used in the Solar Triangle is highly efficient solar panels, which was owned by SunPower brand [1], attached on the art installed roof top. The efficiency received reaches satisfied value at 22 %, making this panel as one of the promising technologies for the clean energy production, whereas the majority of conventional panels range from 15% to 17% in efficiency rating. The other applied technology installed is coloured building integrated photovoltaic (BIPV) panel [2], which offers an aesthetically pleasing alternative without sacrificing too much power. BIPV panels are used to replace conventional building materials in parts of the building envelope such as the roof, skylights, or facades. The advantage of integrated photovoltaics over more common non-integrated systems is that the initial cost can be offset by reducing building materials cost and labour.

Another highlight in Solar Triangle is the Solar Palm Tree. It is an integrated design that imitates the leaves and trunk of a natural palm tree. It consists of one layer of leaves (8 pieces) with Sunpower folding and flexible solar panel [3] on top and multi-colour smart LED layers at the bottom; rain water collecting and filtration system at the crown; and embedded adjustable quick washing facilities attached on the trunk.

The efficiency of the flexible Palm Tree solar firm is around 20-25%, which is about 30% higher than traditional solar panels. In addition, this design collects the solar energy with less occupation of ground space compared with ground-stand solar panels. It can supply the power for lighting during night and other electrical facilities around with excessive power, recycle and save the water resource, and provide shades in summer. Both the location and size of the Solar Palm Tree can be flexible based on varying demands.

